Practical -1
Study of various Network commands used in Linux and Windows

AIM: - Study of various Network commands used in Linux and Windows:

BASIC NETWORKING COMMANDS:

arp –a:- ARPis short form ofaddress resolution protocol, It will show the IP address of your computer along with theIP address andMAC address of your router.

hostname: This is the simplest of all TCP/IP commands. It simply displays the name of your computer.

ipconfig /all: This command displays detailed configuration information about your TCP/IP connection including Router, Gateway, DNS, DHCP, and type of Ethernet adapter in your system

nbtstat –a: This command helps solve problems with NetBIOS name resolution. (Nbt stands for NetBIOS over TCP/IP)

netstat: (network statistics) netstat displays a variety of statistics about a computers active TCP/IP connections. It is a command line tool for monitoring network connections both incoming and outgoing as well as viewing routing tables, interface statistics etc.

e.g.:- netstat -r

nslookup: (name server lookup) is a tool used to perform DNS lookups in Linux. It is used to display DNS details, such as the IP address of a particular computer, the MX records for a domain or the NS servers of a domain. nslookup can operate in two modes: interactive and non-interactive.

e.g.:- nslookup

www.google.com

pathping: Pathping is unique to Window's, and is basically a combination of the Ping and Tracert commands. Pathping traces the route to the destination address then launches a 25 second test of each router along the way, gathering statistics on the rate of data loss along each hop.

ping: (Packet INternet Groper) command is the best way to test connectivity between two nodes. Ping use ICMP (Internet Control Message Protocol) to communicate to other devices.

1. #ping hostname(ping localhost)
2. #ping ip address (ping 4.2.2.2)
3. #ping fully qualified domain name(ping www.facebook.com

Route: route command is used to show/manipulate the IP routing table. It is primarily used to setup static routes to specific host or networks via an interface.

Some important Linux networking commands

1. ip

The ip command is one of the basic commands every administrator will need in daily work, from setting up new systems and assigning IPs to troubleshooting existing systems. The ip command can show address information, manipulate routing, plus display network various devices, interfaces, and tunnels.

ip <OPTIONS> <OBJECT> <COMMAND>

Here are some common use cases for the ip command.

a. To show the IP addresses assigned to an interface on your server:

a. [root@server ~]# *ip address show*

b. To assign an IP to an interface, for example, **enps03**:

a. [root@server ~]# ip address add 192.168.1.254/24 dev enps03

c. To delete an IP on an interface:

a. [root@server ~]# ip address del 192.168.1.254/24 dev enps03

d. Alter the status of the interface by bringing the interface **eth0** online:

[root@server ~]# ip link set eth0 up

e. Alter the status of the interface by bringing the interface **eth0** offline:

[root@server ~]# ip link set eth0 down

f. Alter the status of the interface by enabling promiscuous mode for **eth0**:

[root@server ~]# ip link set eth0 promisc on

g. Add a default route (for all addresses) via the local gateway 192.168.1.254 that can be reached on device **eth0**:

[root@server ~]# ip route add default via 192.168.1.254 dev eth0

h. Add a route to 192.168.1.0/24 via the gateway at 192.168.1.254:

[root@server ~]# ip route add 192.168.1.0/24 via 192.168.1.254

i. Add a route to 192.168.1.0/24 that can be reached on device **eth0**:

[root@server ~]# ip route add 192.168.1.0/24 dev eth0

j. Delete the route for 192.168.1.0/24 via the gateway at 192.168.1.254:

[root@server ~]# ip route delete 192.168.1.0/24 via 192.168.1.254

k. Display the route taken for IP 10.10.1.4:

[root@server ~]# ip route get 10.10.1.4

2. ifconfig

The ifconfig command was/is a staple in many sysadmin's tool belt for configuring and troubleshooting networks. It has since been replaced by the ip command discussed above.

3. mtr

MTR (Matt's traceroute) is a program with a command-line interface that serves as a network diagnostic and troubleshooting tool. This command combines the functionality of the ping and traceroute commands. Just like a traceroute, the mtr command will show the route from a computer to a specified host. mtr provides a lot of statistics about each hop, such as response time and percentage. With the mtr command, you will get more information about the route and be able to see problematic devices along the way. If you see a sudden increase in response time or packet loss, then obviously, there is a bad link somewhere.
The syntax of the command is as follows:
mtr <options> hostname/IP
Let's look at some common use cases.

a. The basic mtr command shows you the statistics, including each hop (hostnames) with time and loss%:

[root@server ~]# *mtr google.com*

b. Show numeric IP addresses (if you use -g, you will get IP addresses (numbers) instead of hostnames):

[root@server ~]# mtr -g google.com

c. Show the numeric IP addresses and hostnames, too:

[root@server ~]# mtr -b google.com

d. Set the number of pings that you want to send:

[root@server ~]# mtr -c 10 google.com

4. tcpdump

The tcpdump command is designed for capturing and displaying packets.

You can install tcpdump with the command below:

[root@server ~]# *dnf install -y tcpdump*

Before starting any capture, you need to know which interfaces tcpdump can use. You will need to use sudo or have root access in this case.
[root@server ~]# *tcpdump -D*

If you want to capture traffic on **eth0**, you can initiate that with tcpdump -i eth0 sample output:
[root@server ~]# *tcpdump -i eth0*

[root@server ~]# *tcpdump -i eth0 -c 10*

Capture traffic to and from one host

You can filter out traffic coming from a specific host. For example, to find traffic coming from and going to 8.8.8.8, use the command:
[root@server ~]# *tcpdump -i eth0 -c 10 host 8.8.8.8*

For traffic coming from 8.8.8.8, use:

[root@server ~]# *tcpdump -i eth0 src host 8.8.8.8*

For outbound traffic going to 8.8.8.8, use:

[root@server ~]# *tcpdump -i eth0 dst host 8.8.8.8*

Capture traffic to and from a network

You can also capture traffic to and from a specific network using the command below:
[root@server ~]# *tcpdump -i eth0 net 10.1.0.0 mask 255.255.255.0*
or:
[root@server ~]# *tcpdump -i eth0 net 10.1.0.0/24*

Capture traffic to and from port numbers

Capture only DNS port 53 traffic:
[root@server ~]# *tcpdump -i eth0 port 53*

For a specific host,

[root@server ~]# *tcpdump -i eth0 host 8.8.8.8 and port 53*

To capture only HTTPS traffic,

[root@server ~]# *tcpdump -i eth0 -c 10 host www.google.com and port 443*

To capture all port except port 80 and 25,

[root@server ~]# *tcpdump -i eth0 port not 53 and not 25*

5. ping

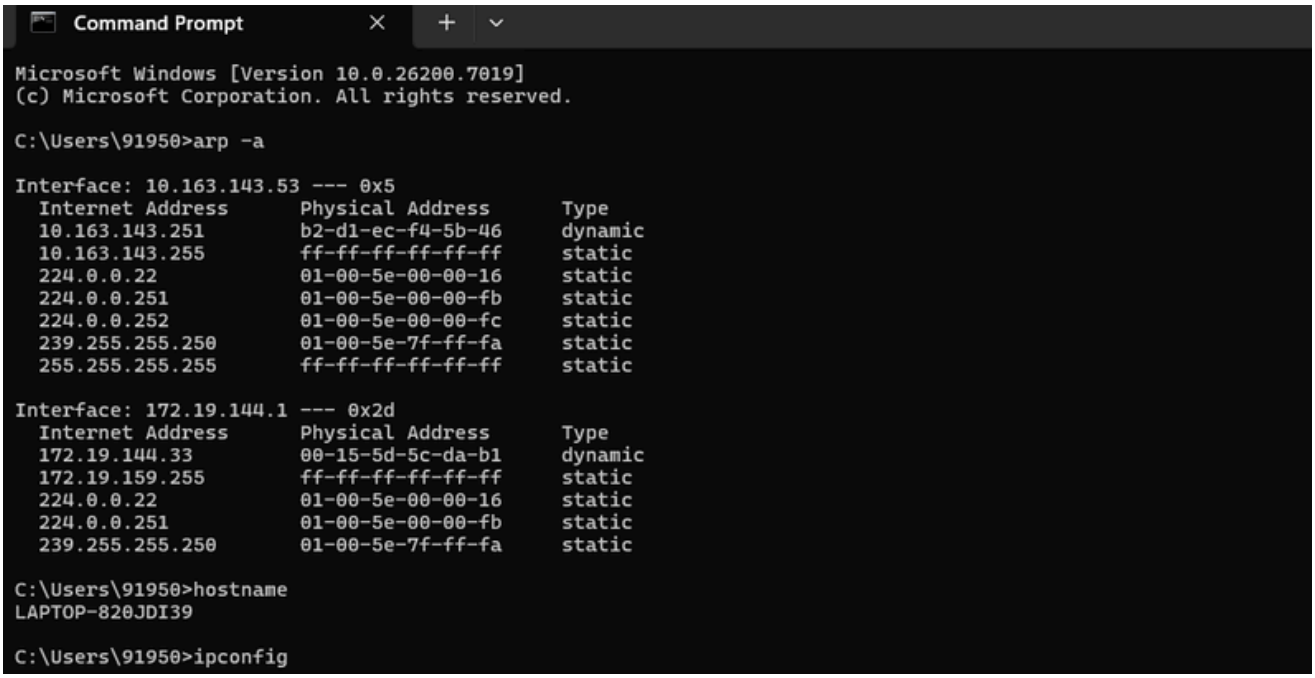
Ping is a tool that verifies IP-level connectivity to another TCP/IP computer by sending Internet Control Message Protocol (ICMP) Echo Request messages. The receipt of corresponding Echo Reply messages is displayed, along with round-trip times. Ping is the primary TCP/IP command used to troubleshoot connectivity, reachability, and name resolution.

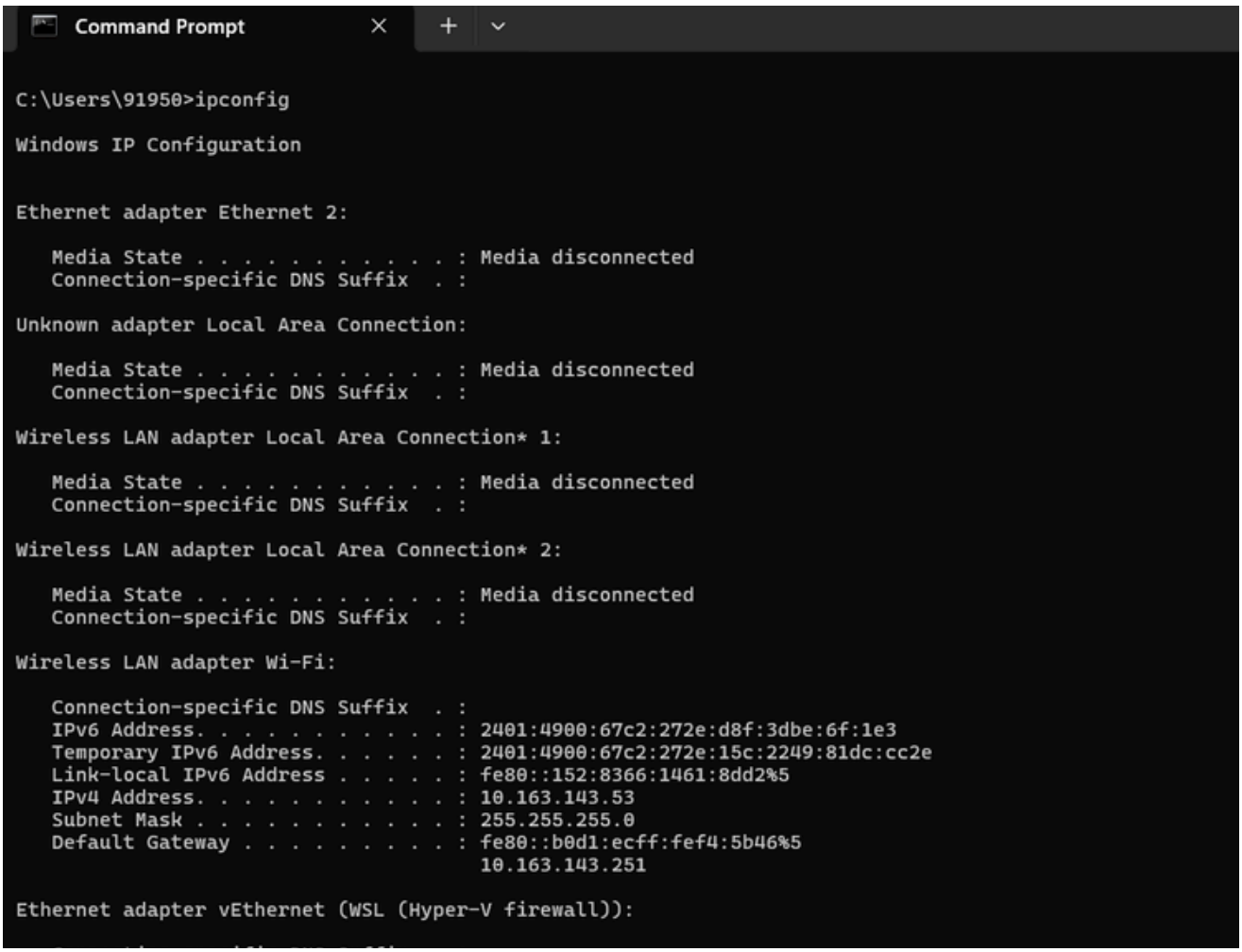
[root@server ~]# ping google.com

PING google.com (216.58.206.174) 56(84) bytes of data.
64 bytes **from** sof02s27-**in**-f14.1e100.net (216.58.206.174): icmp_seq=1 ttl=56 time=10.7 ms
64 bytes **from** sof02s27-**in**-f14.1e100.net (216.58.206.174): icmp_seq=2 ttl=56 time=10.2 ms
64 bytes **from** sof02s27-**in**-f14.1e100.net (216.58.206.174): icmp_seq=3 ttl=56 time=10.4 ms
^C
You need to stop the ping command by pressing **CTRL+C**. Otherwise, it will ping until you stop it.

If you want to ping a host ten times, use the following command:

[root@server ~]# *ping -c 10 google.com*


Command Prompt
Microsoft Windows [Version 10.0.26200.7019]
(c) Microsoft Corporation. All rights reserved.
C:\Users\91950>arp -a
Interface: 10.163.143.53 --- 0x5
Internet Address Physical Address Type
10.163.143.251 b2-d1-ec-f4-5b-46 dynamic
10.163.143.255 ff-ff-ff-ff-ff-ff static
224.0.0.22 01-00-5e-00-00-16 static
224.0.0.251 01-00-5e-00-00-fb static
224.0.0.252 01-00-5e-00-00-fc static
239.255.255.250 01-00-5e-7f-ff-fa static
255.255.255.255 ff-ff-ff-ff-ff-ff static
Interface: 172.19.144.1 --- 0x2d
Internet Address Physical Address Type
172.19.144.33 00-15-5d-5c-da-b1 dynamic
172.19.159.255 ff-ff-ff-ff-ff-ff static
224.0.0.22 01-00-5e-00-00-16 static
224.0.0.251 01-00-5e-00-00-fb static
239.255.255.250 01-00-5e-7f-ff-fa static
C:\Users\91950>hostname
LAPTOP-820JDI39
C:\Users\91950>ipconfig


Command Prompt
C:\Users\91950>ipconfig
Windows IP Configuration
Ethernet adapter Ethernet 2:
Media State . . . . . : Media disconnected
Connection-specific DNS Suffix . :
Unknown adapter Local Area Connection:
Media State . . . . . : Media disconnected
Connection-specific DNS Suffix . :
Wireless LAN adapter Local Area Connection* 1:
Media State . . . . . : Media disconnected
Connection-specific DNS Suffix . :
Wireless LAN adapter Local Area Connection* 2:
Media State . . . . . : Media disconnected
Connection-specific DNS Suffix . :
Wireless LAN adapter Wi-Fi:
Connection-specific DNS Suffix . :
IPv6 Address. . . . . : 2401:4900:67c2:272e:d8f:3dbe:6f:1e3
Temporary IPv6 Address. . . . . : 2401:4900:67c2:272e:15c:2249:81dc:cc2e
Link-local IPv6 Address . . . . . : fe80::152:8366:1461:8dd2%5
IPv4 Address. . . . . : 10.163.143.53
Subnet Mask . . . . . : 255.255.255.0
Default Gateway . . . . . : fe80::b0d1:ecff:fef4:5b46%5
10.163.143.251
Ethernet adapter vEthernet (WSL (Hyper-V firewall)):

Configuring an Ethernet connection by using nmcli

If you connect a host to the network over Ethernet, you can manage the connection's settings on the command line by using the **nmcli** utility.

Procedure

1. List the NetworkManager connection profiles:

```
# nmcli connection show
NAME                UUID                                  TYPE      DEVICE
Wired connection 1  a5eb6490-cc20-3668-81f8-0314a27f3f75  ethernet  enp1s0
```

2. # **nmcli connection add con-name <*connection-name*> ifname <*device-name*> type ethernet**
   Skip this step to modify an existing profile.

3. Optional: Rename the connection profile:

```
# nmcli connection modify "Wired connection 1"
```

Here, "Wired connection 1" is the name of the connection

4. Display the current settings of the connection profile:

```
# nmcli connection show

connection.interface-name:  enp1s0
connection.autoconnect:     yes
ipv4.method:                auto
ipv6.method:                auto
...
```

5. Configure the IPv4 settings:

   To use DHCP, enter:

   # **nmcli connection modify "Wired connection 1" ipv4.method auto**

   Skip this step if ipv4.method is already set to auto (default).

   To set a static IPv4 address, network mask, default gateway, DNS servers, and search domain, enter:

   # **nmcli connection modify "Wired connection 1" ipv4.method manual ipv4.addresses 192.0.2.1/24 ipv4.gateway 192.0.2.254 ipv4.dns 192.0.2.200 ipv4.dns-search example.com**

6. Configure the IPv6 settings:

   To use stateless address autoconfiguration (SLAAC), enter:

   # **nmcli connection modify "Wired connection 1" ipv6.method auto**

   Skip this step if ipv6.method is already set to auto (default).

- To set a static IPv6 address, network mask, default gateway, DNS servers, and search domain, enter:

  #nmcliconnectionmodify“Wiredconnection 1”ipv6.method manual ipv6.addresses2001:db8:1::fffe/64 ipv6.gateway 2001:db8:1::fffe ipv6.dns 2001:db8:1::ffbb ipv6.dns-search example.com

7. Activate the profile:

   # **nmcliconnectionup Internal-LAN**

   Verification

1. Display the IP settings of the NIC:

   # **ip address show enp1s0**
   enp1s0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
   link/ether 52:54:00:17:b8:b6 brd ff:ff:ff:ff:ff:ff
   inet 192.0.2.1/24 brd 192.0.2.255 scope global noprefixroute enp1s0
   valid_lft forever preferred_lft forever
   inet6 2001:db8:1::fffe/64 scope global noprefixroute
   valid_lft forever preferred_lft forever

2. Display the IPv4 default gateway:

   # **ip route show default**

   default via 192.0.2.254 dev enp1s0 proto static metric 102

3. Display the IPv6 default gateway:

   # **ip -6 route show default**
   default via 2001:db8:1::ffee dev enp1s0 proto static metric 102 pref medium

4. Display the DNS settings:

   # **cat /etc/resolv.conf**
   search example.com
   nameserver 192.0.2.200
   nameserver 2001:db8:1::ffbb
   If multiple connection profiles are active at the same time, the order of nameserver entries depend on the DNS priority values in these profile and the connection types.

5. Use the ping utility to verify that this host can send packets to other hosts:

   # **ping *<host-name-or-IP-address>***

```
C:\Users\91950>nmcli connection show

NAME UUID TYPE DEVICE
Wired connection 1 a5eb6490-cc20-3668-81f8-0314a27f3f75 ethernet enp1s0

C:\Users\91950>nmcli connection add con-name Internal-LAN ifname enp1s0 type ethernet

Connection 'Internal-LAN' (b22a1c44-84db-4e78-8a92-7a65db4b7e4a) successfully added.

C:\Users\91950>nmcli connection modify "Wired connection 1"

Connection 'Wired connection 1' successfully modified.

C:\Users\91950>nmcli connection show "Wired connection 1"

connection.id: Wired connection 1
connection.interface-name: enp1s0
connection.autoconnect: yes
ipv4.method: auto
ipv6.method: auto
connection.type: 802-3-ethernet
connection.uuid: a5eb6490-cc20-3668-81f8-0314a27f3f75

C:\Users\91950>nmcli connection modify "Wired connection 1" ipv4.method manual ipv4.addresses
192.0.2.1/24 ipv4.gateway 192.0.2.254 ipv4.dns 192.0.2.200 ipv4.dns-search example.com

C:\Users\91950>nmcli connection modify "Wired connection 1" ipv6.method manual ipv6.addresses
2001:db8:1::fffe/64 ipv6.gateway 2001:db8:1::fffe ipv6.dns 2001:db8:1::ffbb ipv6.dns-search example.com
```

```
C:\Users\91950>nmcli connection up Internal-LAN

Connection successfully activated (D-Bus active path:
/org/freedesktop/NetworkManager/ActiveConnection/3).

C:\Users\91950>ip address show enp1s0

2: enp1s0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen
1000
link/ether 52:54:00:17:b8:b6 brd ff:ff:ff:ff:ff:ff
inet 192.0.2.1/24 brd 192.0.2.255 scope global noprefixroute enp1s0
valid_lft forever preferred_lft forever
inet6 2001:db8:1::fffe/64 scope global noprefixroute
valid_lft forever preferred_lft forever

C:\Users\91950>ip route show default

default via 192.0.2.254 dev enp1s0 proto static metric 102

C:\Users\91950>ip -6 route show default

default via 2001:db8:1::ffee dev enp1s0 proto static metric 102 pref medium

C:\Users\91950>type C:\Windows\System32\drivers\etc\resolv.conf

search example.com
nameserver 192.0.2.200
nameserver 2001:db8:1::ffbb
```

```
C:\Users\91950>ip address show enp1s0

2: enp1s0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen
1000
link/ether 52:54:00:17:b8:b6 brd ff:ff:ff:ff:ff:ff
inet 192.0.2.1/24 brd 192.0.2.255 scope global noprefixroute enp1s0
valid_lft forever preferred_lft forever
inet6 2001:db8:1::fffe/64 scope global noprefixroute
valid_lft forever preferred_lft forever

C:\Users\91950>ip route show default

default via 192.0.2.254 dev enp1s0 proto static metric 102

C:\Users\91950>ip -6 route show default

default via 2001:db8:1::ffee dev enp1s0 proto static metric 102 pref medium

C:\Users\91950>type C:\Windows\System32\drivers\etc\resolv.conf

search example.com
nameserver 192.0.2.200
nameserver 2001:db8:1::ffbb

C:\Users\91950>ping 192.0.2.254

Pinging 192.0.2.254 with 32 bytes of data:
Reply from 192.0.2.254: bytes=32 time<1ms TTL=64
Reply from 192.0.2.254: bytes=32 time<1ms TTL=64
Reply from 192.0.2.254: bytes=32 time<1ms TTL=64
Reply from 192.0.2.254: bytes=32 time<1ms TTL=64

Ping statistics for 192.0.2.254:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

RESULT :

This the study of various networking commands used in linux and windows is completed